# Content Popularity Evolution in Online Social Networks

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## ABSTRACT

Understanding content popularity growth on Online Social Networks (OSNs) is of great importance to Internet service providers, content creators and online marketers. However, most previous studies of OSNs are based on static views of the system, thus neglecting the temporal evolution of the network, and a possible correlation with content popularity growth. Moreover, previous analyses also greatly neglect the impact of the referrers (i.e., incoming links from external sites) on content popularity. We here provide some initial results on the analysis of content popularity growth in YouTube videos. Our study is based on three video datasets, namely popular videos, randomly collected videos, and copyright protected videos, with distinct characteristics in terms of temporal popularity evolution. We also characterize the different referrers that most often lead users to YouTube videos. Our results shed some light into aspects that impact content popularity growth.

## Categories and Subject Descriptors

C.4 [**Computer Systems Organization**]: Performance of Systems—*Measurement techniques*; H.3.5 [**Information Storage and Retrieval**]: Online Information Services—*Web-based services*

## General Terms

Human Factors, Measurement

## Keywords

OSNs, YouTube, video popularity, popularity growth

## 1. THEORETICAL BACKGROUND

This paper describes a PhD work, being developed at the Universidade Federal de Minas Gerais. The work started in July 2010 and is expected to finish by July 2015.

Given that Online Social Networks (OSNs) are currently a major segment of the Internet, understanding content popularity growth on these networks is of great relevance to a broad range of services, from technological, economical and social perspectives. Such understanding can drive the design of cost-effective caching and content distribution mechanisms as well as uncover potential bottlenecks in system components such as search engines [5]. Moreover, predicting popularity is also important not only for supporting online and viral marketing strategies as well as effective information services (e.g., content recommendation and searching services) but also because it may uncover new (online and offline) business opportunities. From a sociological point of view, a deep study of popularity evolution may also reveal properties and rules governing collective user behavior [6].


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## 2. OBJECTIVES

The main objective of our work is to understand the diffusion and evolution of content popularity in large scale OSNs. In particular, we are interested on dealing with OSNs which focus on user created content (UGC) [1], due to the volume [5, 6] and more complicated nature of such media [4]. One representative example of such OSNs is YouTube[2], being the largest video sharing network nowadays.

In broader terms, we aim at understanding the evolution of content popularity with respect to three main research challenges (RC): (1) popularity growth patterns, which are related to the different patterns of popularity evolution across UGC content; (2) the referrers (i.e. incoming links) of UGC, which deals with how users find content on OSN and how this impacts popularity evolution; and finally, (3) how changes in the structure of the OSN affect popularity.

We begin our study with a review of the related literature in Section 3. A description of each challenge is presented in Section 4, while our research methodologies are presented in Section 5. In order to provide initial insights on *RC 1-2*, we characterized the growth patterns of video popularity on YouTube [8]. Using newly provided data by the application, we analyzed how the popularity of individual videos evolves since the video's upload time. We also characterize the different referrers for each video. Our results reveal differences in popularity evolution patterns depending on different video samples (top, random and copyrighted). These are presented in Section 6. Section 7 concludes the work.

## 3. RELATED WORK

**Static views of popularity:** There have been a few studies that address content popularity on OSNs, and, particularly, on video sharing systems. Cha *et al.* [5] presented

[1]Online radios, such as LastFM (`http://www.last.fm`), are examples OSNs which does not deal with UGC.
[2]`http://www.youtube.com`